Antares™ Medium-Class Launch Vehicle

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Orbital
Innovation You Can Count On®

Introduction & System Features

MEDIUM-CLASS LAUNCH SERVICES FOR THE 21ST CENTURY

Antares is a two-stage launch vehicle designed to provide responsive, cost-effective, and reliable access to orbit and Earth escape for medium-class payloads weighing over 5,000 kg. Antares is designed to be a highly reliable launcher to meet NASA Category 3 and similar DoD mission success standards, and incorporates flight-proven subsystems to reduce development cost, schedule and risk.

Low Risk Design

Antares incorporates flight-proven components from leading global suppliers and subsystems already successfully deployed on other Orbital launch vehicles.

Affordable

Projected launch services rates represent significant savings over existing medium- and intermediate-class launchers, reducing total mission cost.

Leverages Flight-Proven Technologies

The Antares first stage is powered by dual AJ26-62 engines, with second stage propulsion provided by a CASTOR® 30B solid motor (CASTOR 120 heritage). An optional CASTOR 30XL second stage, Bi-propellant Third Stage (BTS) and STAR™ 48-based third stage is also available.

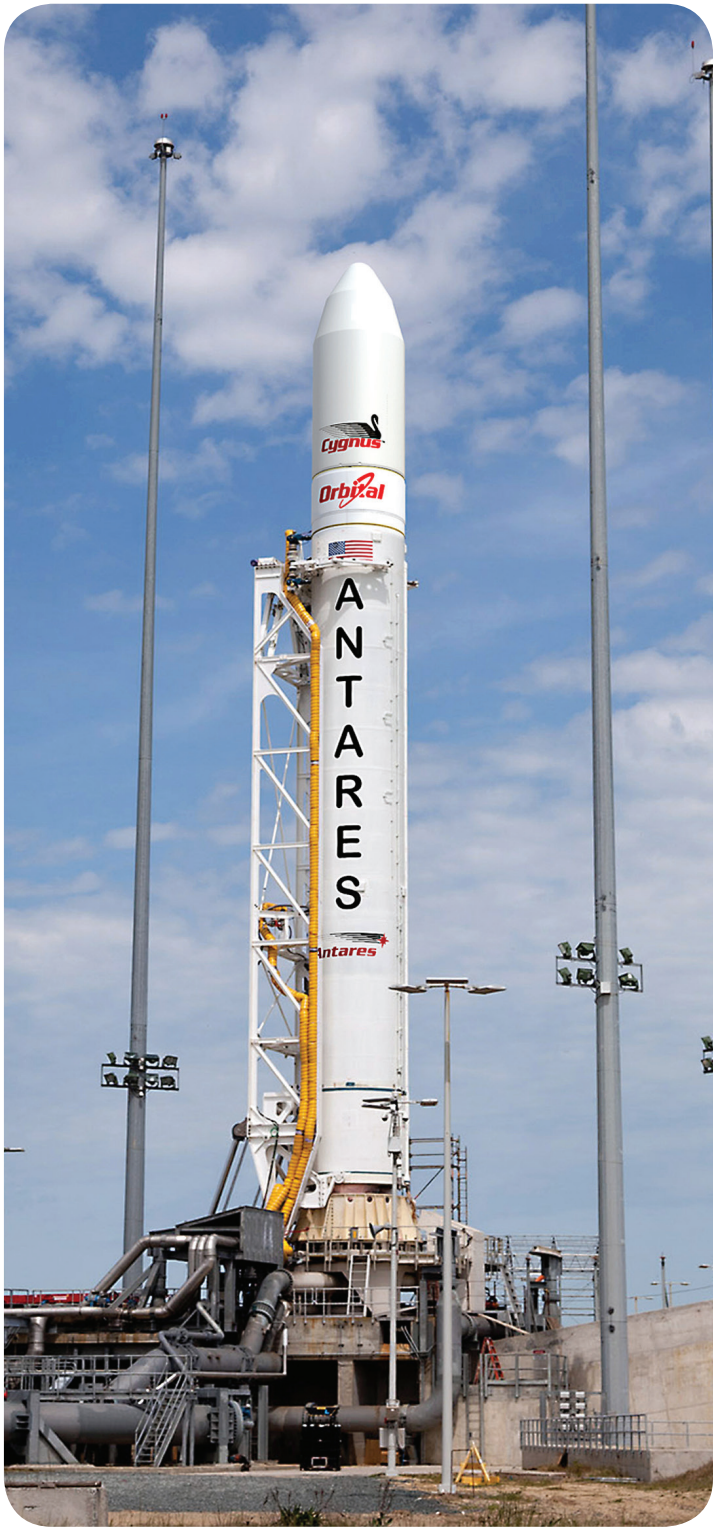
Fills Medium-Class Launch Services Gap

Antares fills the service gap between medium-light Minotaur IV-class launch vehicles and intermediate-lift Delta IV and Atlas 5 offerings.

Internally funded by Orbital, Antares is currently under development with initial launch capability in 2013 with a test flight, followed by a demonstration of commercial re-supply services for the International Space Station (ISS) under a NASA Commercial Orbital Transportation Services (COTS) agreement. The first of eight Commercial Resupply Services (CRS) missions to deliver cargo to the ISS is scheduled for later in 2013. Future applications include the launch of medium-class science, defense and commercial missions.

KEY FEATURES

- Incorporates both solid and liquid stages and flight-proven technologies to meet medium-class mission requirements
- Provides substantial payload performance into a variety of low inclination low-Earth and sun-synchronous orbits and interplanetary trajectories
- 3.9 meter fairing accommodates large payloads
- Streamlined vehicle/payload integration and testing via simplified interfaces reduce time from encapsulation to lift-off
- Capable of launching single and multiple payloads
- Initial launch capability in 2013 from Wallops Flight Facility (WFF)
- Compatible with the Western Range at Vandenberg Air Force Base (VAFB), Wallops Flight Facility, Eastern Range at Cape Canaveral Air Force Station (CCAFS) and Kodiak Launch Complex (KLC)



System Description & Parameters

VEHICLE DESCRIPTION / STAGES

Stage 1

- Two Aerojet (Rocketdyne) AJ26-62 engines each with independent thrust vectoring
- Liquid oxygen/kerosene fueled
- Engine design validated through cumulative test time exceeding 27 hours and recent engine confidence and acceptance tests
- System development and verification by Orbital with Aerojet providing detailed engine design expertise
- Core tank assembly design and design verification by KB Yuzhnoye with active involvement from Orbital (Zenit-derived heritage)
- Core tank assembly production by Yuzhmash
- Avionics stage controller uses flight-proven Orbital Modular Avionics Control Hardware (MACH) components

Stage 2

- ATK CASTOR 30B solid motor (CASTOR 120 heritage) with thrust vectoring
- Configuration uses a 76:1 expansion ratio nozzle
- Avionics are flight-proven MACH components
- Attitude control system incorporates Orbital Space Launch Vehicle-heritage hardware
- Optional CASTOR 30XL Stage 2 motor

Optional Bi-Propellant Third Stage (BTS)

Helium pressure regulated bi-propellant propulsion system using nitrogen tetroxide and hydrazine (Orbital GEOStar™ bus heritage)

Optional STAR 48-Based Third Stage:

- ATK STAR 48BV high energy upper stage solid rocket motor
- Thrust vector guidance and control
- 3-axis stabilized satellite orbit insertion

PARAMETERS

Stage 1:

Tank Structure:	Aluminum
Propulsion:	Dual AJ26-62
Propellant:	LOX/RP
Thrust:	3,265kN (S.L.) 3,630kN (Vac)
Pressurization:	Helium gas
Attitude Control:	Hydraulic TVC
Separation:	Hold down bolt release

Stage 2:

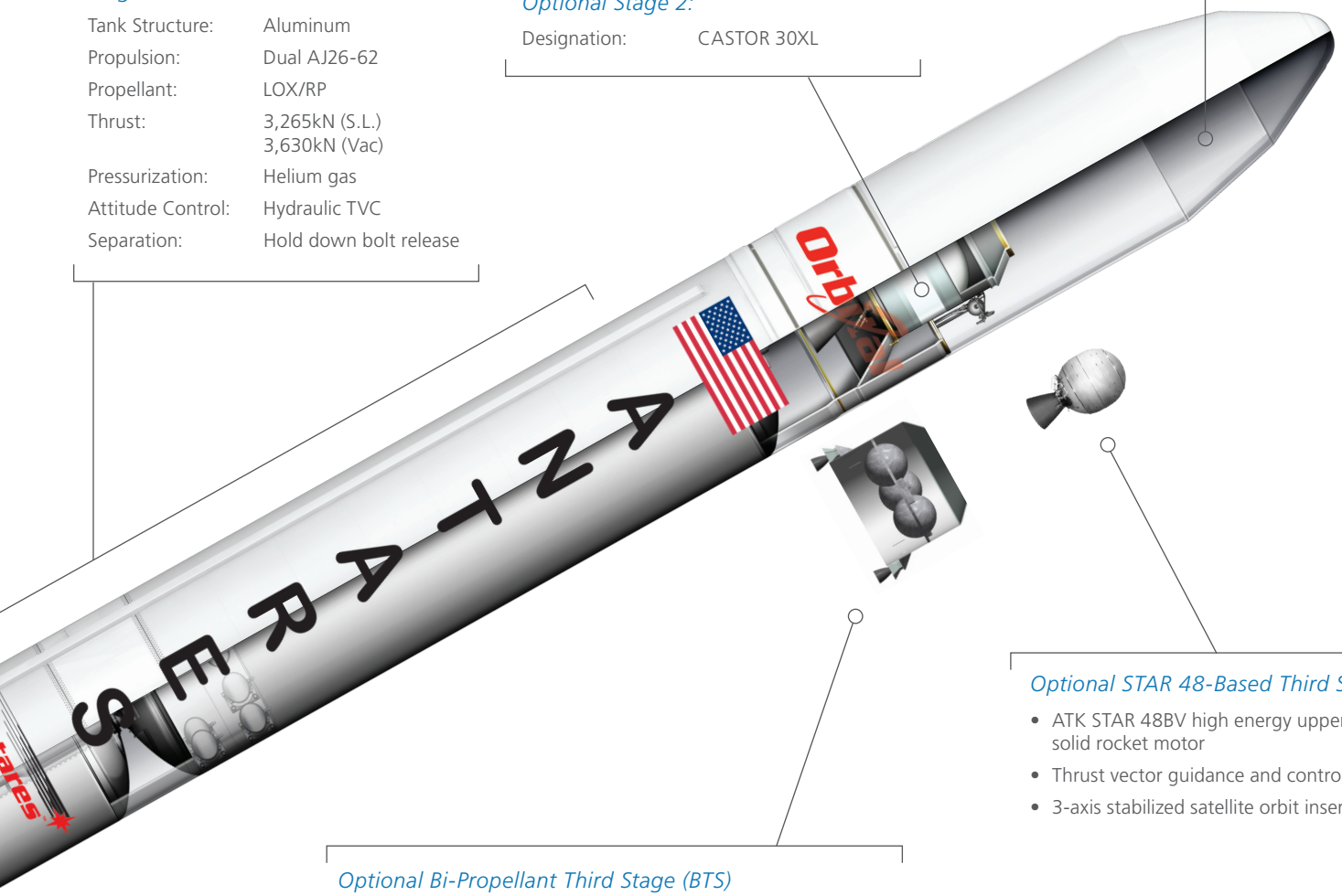
Designation:	CASTOR 30B
Diameter:	2.36 meters
Thrust:	293.4kN (Avg) 395.7kN (Max)
Attitude Control:	Electromechanical TVC
Separation:	Non-contaminating frangible ring

Optional Stage 2:

Designation:	CASTOR 30XL

Payload Fairing:

Diameter:	3.9 meters
Height:	9.9 meters
Structure:	Honeycomb core, composite face
Separation:	Non-contaminating frangible ring



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Launch Sites, Performance & Payload Accommodations

LAUNCH SITES

Antares is compatible with Wallops Flight Facility in Virginia, Western Range at Vandenberg Air Force Base in California, Eastern Range at Cape Canaveral Air Force Station in Florida, and Kodiak Launch Complex in Alaska, providing customers with a variety of launch locations and trajectories. Initial launch capability will be from Wallops Flight Facility with additional launch site availability based on market demand.

Wallops Flight Facility (WFF)

NASA's WFF in Virginia is home to the Antares COTS/CRS launch program and supports mid-inclination and high-energy missions.

Cape Canaveral Air Force Station (CCAFS)

CCAFS, with its core competence in expendable launch vehicle operations and manned spaceflight, is the Antares launch location for low-inclination missions.

Vandenberg Air Force Base (VAFB)

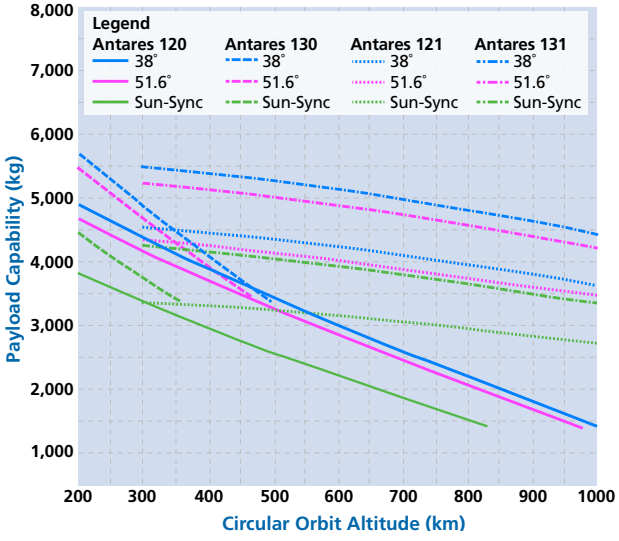
Antares leverages Orbital's experienced launch operations team and extensive VAFB facilities to achieve unparalleled responsiveness. VAFB is a prime location for high-inclination, sun-synchronous launches.

Kodiak Launch Complex (KLC)

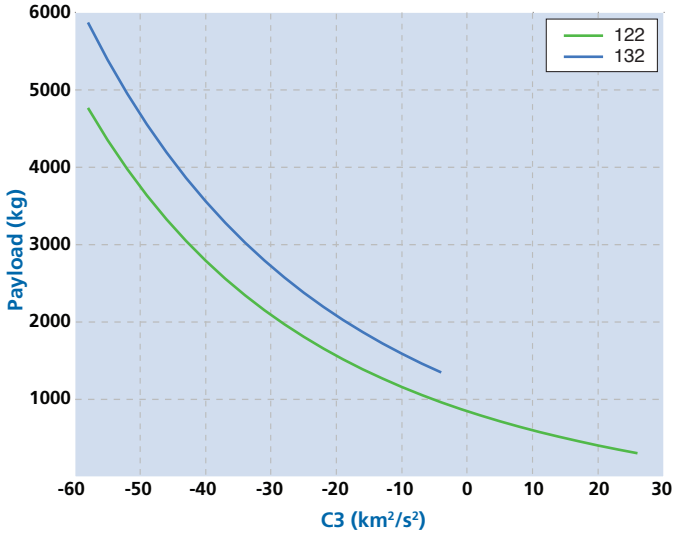
KLC is a mature launch complex with facilities to support spacecraft checkout and fueling operations. KLC in Alaska provides Antares with another prime location for launching high-inclination, sun-synchronous missions.

PERFORMANCE

Low-Earth Orbit (Circular)



High Energy

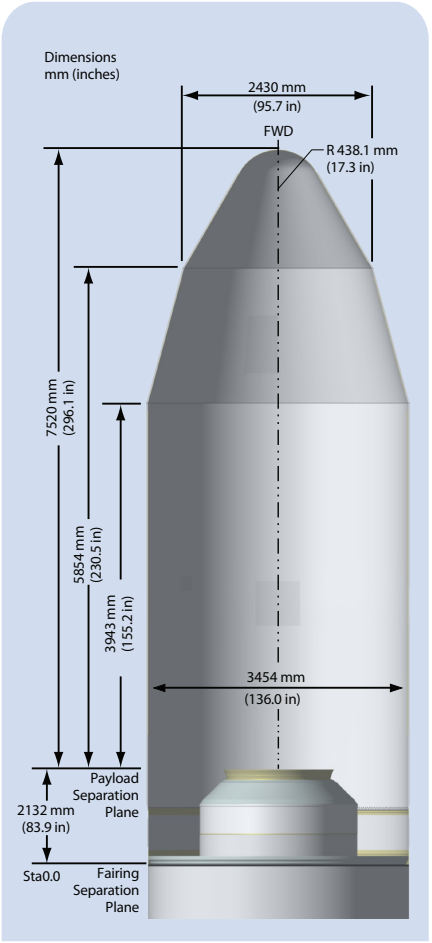


Antares Configuration Numbering

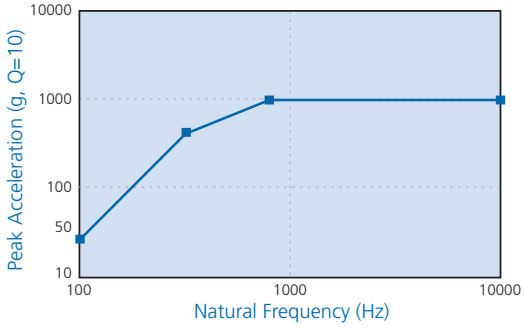
First Stage	*Second Stage*	*Third Stage*
1–Two AJ26-62 LOX/ Kerosene Fueled Engines	2–CASTOR 30B Solid Motor 3–CASTOR 30XL Solid Motor	0–None 1–Bi-Propellant Third Stage (BTS) 2–STAR 48BV Solid Motor

PAYLOAD ACCOMMODATIONS:

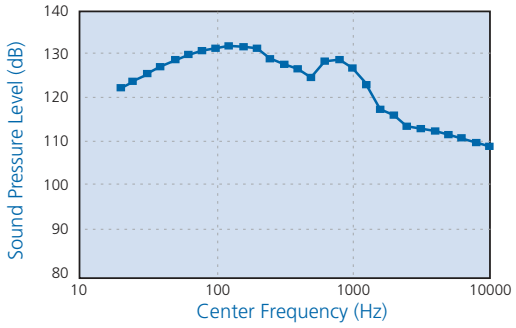
- Standard 3.9m (155 in.) diameter spacecraft fairing
- Standard fairing access doors for spacecraft support - two standard 0.6m (24 in.) diameter mission/spacecraft specific access zones
- Launch vehicle environments are developed using well-defined processes, and analytical models validate through correlation with flight data from hundreds of launches and dozens of launch vehicle configurations
- RUAG 1194VS flight-proven payload adapter system, including low-shock design
- RUAG 1666 and 937 payload adapter systems available
- Optional payload instrument nitrogen purge
- Thermally controlled fairing volume with standard Class 8 (100k) cleanliness, optional Class 7 (10k) cleanliness available



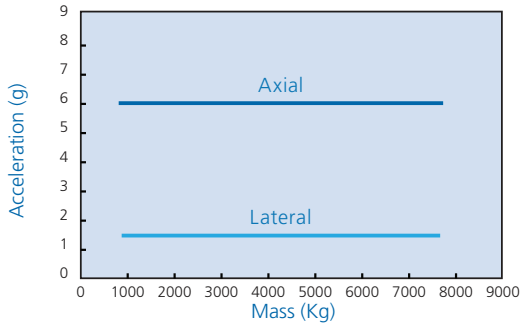
Shock Environment



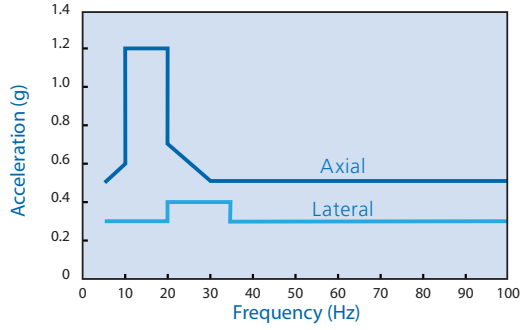
Acoustic Environment



Acceleration Environment



Sine Vibration Environment



Payload Attach Fitting,
RUAG 1194VS

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BUILDING ON A HERITAGE OF SUCCESS

Orbital has successfully developed more launch vehicles during the last 20 years than any other organization. The Antares launch system leverages Orbital's heritage of our highly successful Pegasus® and Minotaur space launch vehicles, as well as launch vehicles developed for the nation's missile defense system. Antares is being developed, manufactured and launched using management approaches, engineering standards, and production and test processes common to Orbital's other major launch vehicles.

Since the company's founding in 1982, Orbital has delivered and launched over 600 launch vehicles with one of the industry's best mission success records. Orbital's excellent reliability record reflects conservative engineering, aggressive supplier management, and disciplined manufacturing and test processes. The company has over 75 additional vehicles on contract for delivery to customers through 2016.

STATE-OF-THE-ART ENGINEERING, MANUFACTURING AND TEST FACILITIES

Orbital's launch vehicle engineering and test facilities are situated on Orbital's 44-acre Chandler, Arizona campus. Featuring 500,000 square feet of engineering, program offices, manufacturing bays and test labs in one location, the facility is fully AS9100 and ISO 9001 Certified.

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